

Amendments to the Specification:

Please replace the paragraphs starting with "SUMMARY OF THE INVENTION" beginning on page 3, lines 26-32, and ending on page 3, lines 1-32, with the following amended paragraphs:

SUMMARY OF THE INVENTION

In order to solve the above and other problems, according to a first aspect of the current invention, a method of recognizing a frame in a document image, including: inputting document image data; extracting a black pixel rectangle that circumscribes continuous black pixels, the black pixel rectangle defining a parent rectangle; determining whether or not the parent rectangle is a frame candidate based upon a predetermined set of first criteria; extracting a white pixel rectangle that circumscribes continuous white pixels within the parent rectangle of the frame candidate; and further determining whether or not the frame candidate is a frame based upon a predetermined set of second criteria, the second criteria including at least a comparison of a certain aspect between the white pixel rectangle and the black pixel rectangle.

According to a second aspect of the current invention, a computer readable medium storing a computer program for recognizing a frame in a document image, the computer program providing computer instructions to perform the following steps of: inputting document image data; extracting a black pixel rectangle that circumscribes continuous black pixels, the black pixel rectangle defining a parent rectangle; determining whether or not the parent rectangle is a frame candidate based upon a predetermined set of first criteria; extracting a white pixel rectangle that circumscribes continuous white pixels within the parent rectangle of the frame candidate; and further determining whether or not the frame candidate is a frame based upon a predetermined set of second criteria, the second criteria including at least a comparison of a certain aspect between the white pixel rectangle and the black pixel rectangle.

According to a third aspect of the current invention, a system for recognizing a frame in a document image, including: an input ~~unit-device~~ for inputting document image data; a black pixel rectangle extraction ~~unit-device~~ connected to the input ~~unit-device~~ for extracting a black pixel rectangle that circumscribes continuous black pixels, the black pixel rectangle defining a parent rectangle; a first determination ~~unit-device~~ connected to the black pixel rectangle extraction ~~unit-device~~ for determining whether or not the parent rectangle is a frame candidate based upon a predetermined set of first criteria; a white pixel rectangle extraction ~~unit-device~~ connected to the first determination ~~unit-device~~ for extracting a white pixel rectangle that circumscribes continuous white pixels within the parent rectangle of the frame candidate; and a second determination ~~unit-device~~ connected to the black pixel rectangle extraction unit and the white pixel rectangle extraction ~~unit-device~~ for further determining whether or not the frame candidate is a frame based upon a predetermined set of second criteria, the second criteria including at least a comparison of a certain aspect between the white pixel rectangle and the black pixel rectangle.

According to the fourth aspect of the current invention, a device for recognizing a frame in a document image, including an input unit for inputting document image data, a black pixel rectangle extraction unit connected to the input unit for extracting a black pixel rectangle that circumscribes continuous black pixels, the black pixel rectangle defining a parent rectangle, a first determination unit connected to the black pixel rectangle extraction unit for determining whether or not the parent rectangle is a frame candidate based upon a predetermined set of first criteria, a white pixel rectangle extraction unit connected to the first determination unit for extracting a white pixel rectangle that circumscribes continuous white pixels within the parent rectangle of the frame candidate, and a second determination unit connected to the black pixel rectangle extraction unit and the white pixel rectangle extraction unit for further determining whether or not the frame candidate is a frame based upon a predetermined set of second criteria, the second criteria including at least a comparison of a certain aspect between the white pixel rectangle and the black pixel rectangle.

According to the fifth aspect of the current invention, an apparatus for recognizing a frame in a document image, including, an input means for inputting document image data, a black pixel rectangle extraction means connected to the input means for extracting a black pixel rectangle that circumscribes continuous black pixels, the black pixel rectangle defining a parent rectangle, a first determination means connected to the black pixel rectangle extraction means for determining whether or not the parent rectangle is a frame candidate based upon a predetermined set of first criteria; a white pixel rectangle extraction means connected to the first determination means for extracting a white pixel rectangle that circumscribes continuous white pixels within the parent rectangle of the frame candidate, and a second determination means connected to the black pixel rectangle extraction means and the white pixel rectangle extraction means for further determining whether or not the frame candidate is a frame based upon a predetermined set of second criteria, the second criteria including at least a comparison of a certain aspect between the white pixel rectangle and the black pixel rectangle.